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ABSTRACT

This paper examines the method of instruction referred to as the "Keller" method, which is characterized by self-pacing, use of proctors, unit perfection criterion, immediate feedbak, and frequent testing over relatively small units. Incorporating several design features not found in previous studies on this method, it was found that all of the basic elements of the Keller method contribute significantly to its overall effectiveness in learning (course exam) and in retention (3-month follow-up) of material. These results are consistent with others that recommend this approach as a promising method of instruction, particularly at the undergraduate level. (Author)

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Elemental Analysis of the Keller Method of Instruction

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This paper examines the method of instruction referred to as the "Keller" method, which is characterized by self-pacing, use of proctors, unit perfection criterion, immediate feedback, and frequent testing over relatively small units. Incorporating several design features not found in previous studies on this method, it was found that all of the basic elements of the Keller method contribute significantly to its overall effectiveness in learning (course exam) and in retention (3-month follow-up) of material. These results are consistent with others that recommend this approach as a promising method of instruction, particularly at the undergraduate level.

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Statement of Problem

Since Keller's article, "Goodbye, Teacher . . . " (1968) was published, there has been a growing use of his method of teaching that is characterized by self-pacing, use of proctors, unit perfection criterion, immediate feedback, and frequent testing over relatively small units. This method of teaching, variously referred to as the "Keller" method (McMichael & Cory, 1969) or PSI (for personalized System of Instruction, Sherman, 1971), is being applied to many academic subjects in a large number of undergraduate institutions throughout the United States. For some, this method provides the solution for many of the problems of contemporary mass education. It is the purpose of this paper to examine the elements of this method of instruction.

Six elements can be found in most applications of the "Keller" method (there are wide variations across applications): 1. the use of proctors (student teacher-aids): 2. extensive interaction between student and teacher or proctor; 3. frequent tests over relatively small units; 4. unit-perfection criterion for advancement to new materials; 5. immediate feedback; and 6. self-pacing by the student. Through the use of trained undergraduate and graduate student proctors who function as teacher-aids (and who have gone through the course previously), students are provided with the opportunity for frequent and extensive interaction with the teaching staff. This interaction is centered around frequent brief tests over small units of material that a student must pass one at a time, with 100% accuracy. Failure to meet criterion results in the student retaking exams until the criterion is met. At each testing, immediate feedback is given the student by the proctor. Once a unit is passed, the student may proceed to the next unit. Since all testing is on an individual basis, the rate of progress through the course is determined by the student. As a consequence of this focus on individual testing and progress, formal classes and lectures are de-emphasized.

Several studies (e.g., McMichael & Cory, 1969; Born, et. al., 1972, etc.) have demonstrated the superiority of the Keller method over the older and more traditional lecture method. Typically, this difference has been investigated by dividing a course into two groups of students and teaching half of the students by the lecture method and half by the Keller method. Unfortunately, very few of the studies (only Alba & Pennypacker, 1972, and Cooper & Greiner, 1971) pretested students; most have depended on random assignment for equal groups, and have assumed that both methods lead to some learning. Similarly, only a few studies (Cooper & Greiner, 1971; Born, et. al., 1972) checked for retention by a follow-up test. Finally, no study could be found that has, (1) systematically evaluated the relative contributions of each of the elements within the Keller method to its overall effectiveness and (2) measured the added effect on learning of providing lectures along with the Keller method. It is, therefore, the purpose of this paper to present the results of a study that systematically evaluates the relative contributions of lectures and elements within the Keller method, while checking for both equivalence of groups through pretesting and checking for retention through follow-up.

Subjects used

The study was conducted in a large (282 students) undergraduate course in personality psychology during a regular school semester. Most of the students were either in their second or third year at the university and were majoring in either a social or behavioral science (about 50% were psychology majors). Every student had at least two semesters of psychology prior to enrolling in the course.

The 25 proctors assisting in the course were senior undergraduate psychology majors, who had received an "A" grade in the course the previous semester, who had been recommended by proctors the previous semester, and who had above a 3.2 academic average on a 4.0 scale. Each proctor was carefully screened and supervised by the instructor and four graduate teaching assistants. The proctors

collected most of the data on the students during the course.

Procedure

All students were pretested at the beginning of the semester on a 100-item multiple choice course test. Subject data was also collected. At this time, all students were randomly assigned to one of six instruction conditions. (Common to all six conditions were: 1. pretesting; 2. five 50-item multiple choice section examinations during the course, each covering one-fifth of the test; 3. post-testing; 4. follow-up testing.)

Condition A consisted of two weekly one-hour lectures (required attendance), in addition to the regular Keller method of teaching, in which (1) proctors tested students at (2) a unit-perfection criterion over 23 small units of material giving (3) immediate feedback as to performance and (4) allowing students to go at their own rate.

Condition B was exactly like condition A, except for the absence of the required lectures.

Condition C was exactly like condition A, except for the absence of (4) self-pacing. Here, students were required to complete a preset amount of material each week.

Condition D was similar to condition C, except for the (2) absence of units. Here, students took only the pre-, post-, and follow-up exams, and the five section examinations.

Condition E was essentially the lecture method, but with proctors who assisted in testing, giving only delayed (one week) feedback concerning exam performance.

Condition F was the same as condition E, but without proctors.

In those conditions in which lectures were given, attendance was required and checked. Grades were determined by the number of section exams on which criterion was reached, as well as by the level of present criterion reached on the final exam. Students in all conditions could retake parallel forms of the

section and final exams as many times as necessary to reach criterion (within the time limits allowed the course). All unit exams in conditions A-C were short answer essay exams and were conducted orally between a student and proctor. For the sake of the study, except for unit examinations in conditions A-C, the usual requirement of mastery (reaching criterion on a section exam) before going to the next material, was waived.

Students were administered the 100-item multiple choic post-test (final exam) at the end of the course. Those students in conditions A and B, who completed the five section exams before the end of the semester, were administered the post-test within two weeks after completion of the final section. (This resulted in only a small proportion of the students in these conditions taking the exam before the end of the semester.)

Students were told upon taking the post-test, that they would be contacted in three months for a follow-up exam. Of the 282 students who took the post-test, 156 students took the 100-item multiple choice follow-up exam.

Results

An overall F-test across groups and multiple t-tests between groups, revealed no significant differences among or between groups on pre-test performance and grade point averages. Chi-squares yielded no significant differences in group composition in terms of major and previous courses in psychology. Pre- to post-test change scores were examined by the method of planned comparisons (Hays, 1963). Five independent comparisons were made. Change scores for conditions A and B were not significantly different. Combined group change scores for A and B were significantly larger ($t=3.77$, $df=191$, $p<.001$) than combined change scores for C and D. Similarly, combined group change scores for C and D were significantly larger ($t=3.39$, $df=180$, $p<.002$) than combined change scores for E and F. Change scores for condition C were significantly larger ($t=2.48$, $df=90$, $p<.02$) than for condition D. Finally, no significant differences were found between change scores for conditions E and F.

Planned comparisons done on change scores from pre- to follow-up yielded similar results. Significant differences at the .02 level of probability were found between AB and CD, between CD and EF, and between C and D. The differences between A and B and between E and F were not significant. No significant differences were found in change scores from post- to follow-up between conditions.

An overall repeated measures ANOVA from pre- to post- was significant across groups ($F=5.31$, $df=5/276$, p .001) and between pre- and post- ($F=21.86$, $df=1/276$, p .001). Interaction was non-significant. Similar results were found with a repeated measures ANOVA across groups and between pre-test and follow-up. Multiple t-tests performed on each condition from pre- to follow-up indicated that all differences between pre-test and follow-up scores were significant except for conditions E and F, in which the differences were slightly below the .05 level of significance. A check for differential mortality on the follow-up indicated that those who took the follow-up represented random samples of the original groups.

Conclusions

The results indicate that each of the four principle elements of the Keller method (1) using proctors to test students at (2) a unit-perfection criterion over small units of material giving (3) immediate feedback as to performance and (4) allowing students to go at their own rate, contribute to the overall effectiveness of this method of instruction. Further, the addition of lectures as a supplement to the Keller method does not lead to a significant increment in performance on a course post-test.

While all six conditions lead to improved performance on a post-test over a pre-test, these increments become non-significant for two conditions, lectures, and proctors and lectures alone, on a three-month follow-up.

Overall, these results are consistent with those cited earlier in comparisons between the Keller method and lecture method. Specifically, the data from this study indicate the importance of each of the basic elements of the Keller method.

Despite their importance, however, their applications can take and have taken varied forms without any significant diminution in effectiveness (Calhoun, in press). This flexibility combined with effectiveness continue to recommend the Keller method as a promising method of instruction, particularly at the undergraduate level.

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